

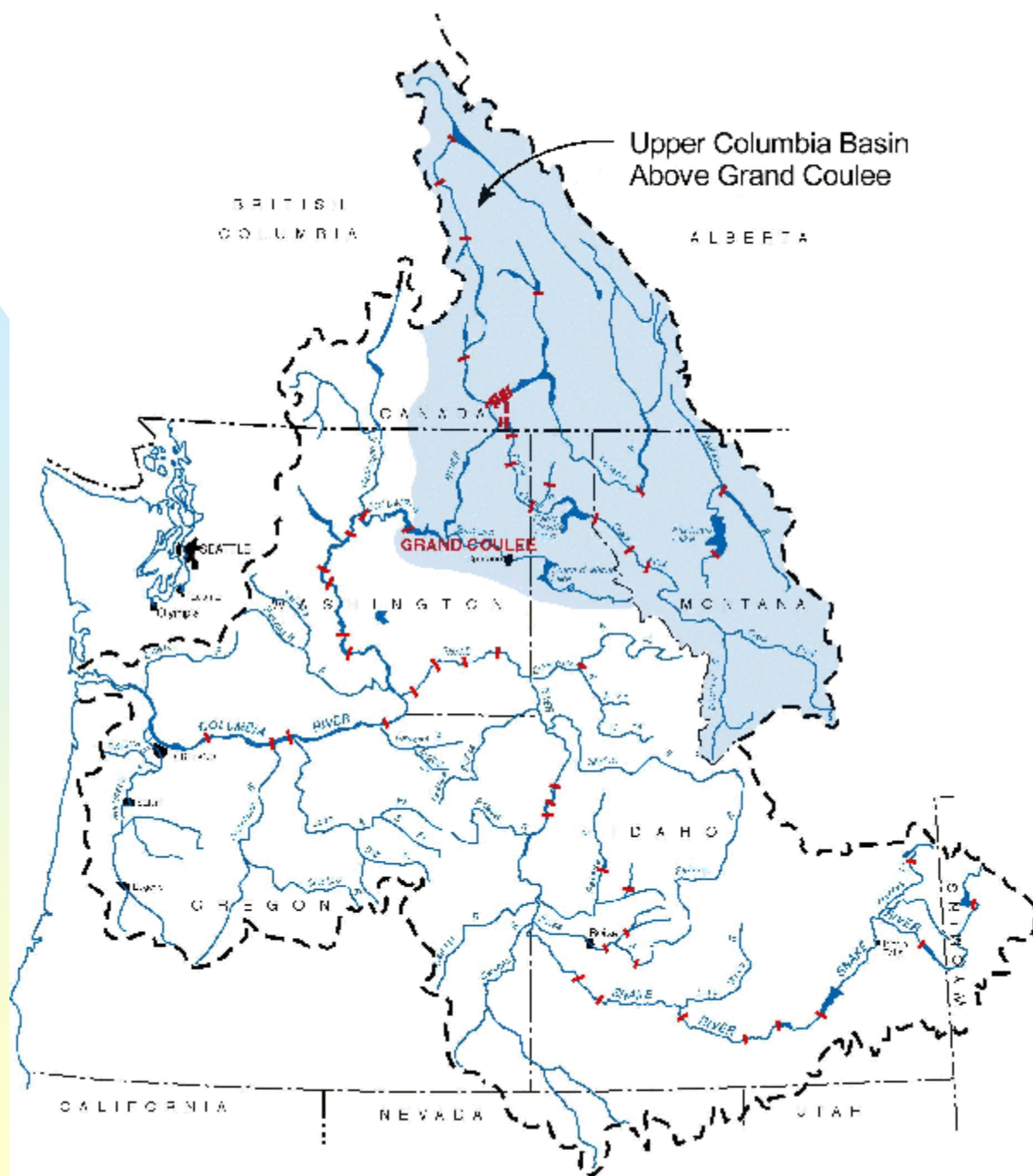
Columbia/Snake River Mainstem TMDL

Toward Ecosystem Based Management Conference

Spokane, Washington

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Purpose of this Session

Explain Site Potential Temperature in the context of the Columbia River Temperature TMDL.

Discuss the implications of using site potential temperature in the.

Purpose of the TMDL

To identify the target temperatures for the Columbia River as established by State Water Quality Standards and determine the thermal load or temperature that can be added to the river without exceeding those target temperatures.

Water Quality Standards

The Water Quality Standards for this TMDL are the natural temperatures of the Columbia River plus small incremental increases due to human activity.

Water Quality Standards

Columbia River Above Grand Coulee:

“Temperature shall not exceed 16 C (60.8 F) due to human activities. When natural conditions exceed 16 C (60.8 F) no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 C (0.5 F).

Incremental temperature increases resulting from point source activities shall not, at any time, exceed $t=28/(T+7)$. Incremental activities resulting from nonpoint source activities shall not exceed 2.8 C (5.4 F).”
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Water Quality Standards

Natural temperatures for this TMDL are those that would occur in the Columbia River within the TMDL study area in the absence of human activity in the river in the study area.

These are termed Site Potential Temperatures in the TMDL.

Determine Target Temperatures

1. Determine the Site Potential (SP) Temperatures
2. Apply the WQS for each reach.

Columbia River Target Temperatures

<u>River Reach</u>	<u>Criterion</u>	<u>SP<Criterion</u>	<u>SP>Criterion</u>
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Canadian Border to Grand Coulee

16 C	$SP + 23/(T+5)$	$SP + 0.3 \text{ C}$
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Grand Coulee to Chief Joseph

16 C	$SP + 23/(T+5)$	$SP + 0.3 \text{ C}$
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Chief Joseph to Priest Rapids

18 C	$SP + 28/(T+7)$	$SP + 0.3 \text{ C}$
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Priest Rapids to OR/WA Border

20 C	$SP + 34/(T+9)$	$SP + 0.3 \text{ C}$
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OR/WA Border to the Mouth

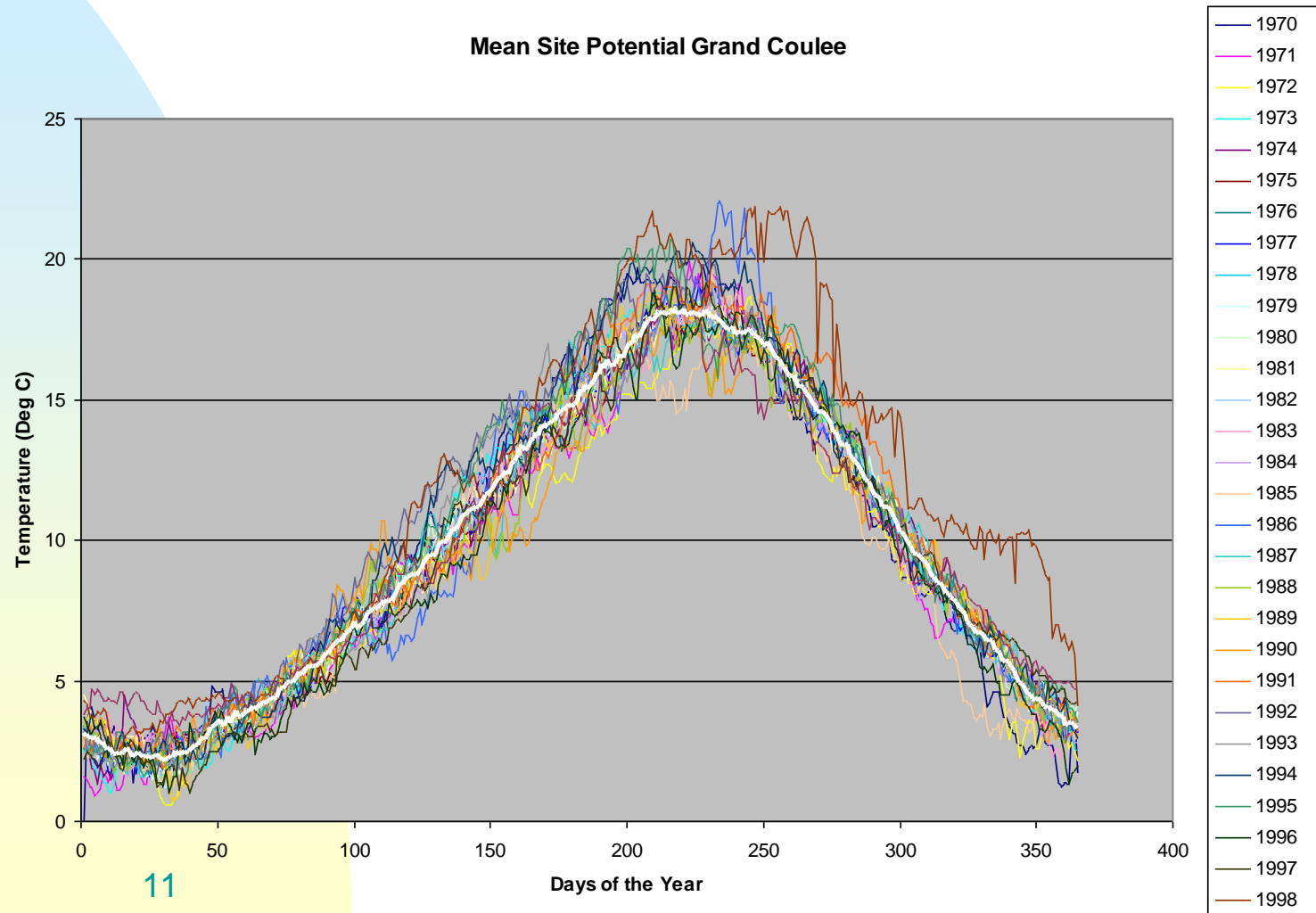
20 C	$SP + 1.1 \text{ C}$	$SP + 0.14 \text{ C}$
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Site Potential Temperature

The Site Potential Temperatures vary spatially and temporally. They vary from day to day and from year to year and they vary along the river length.

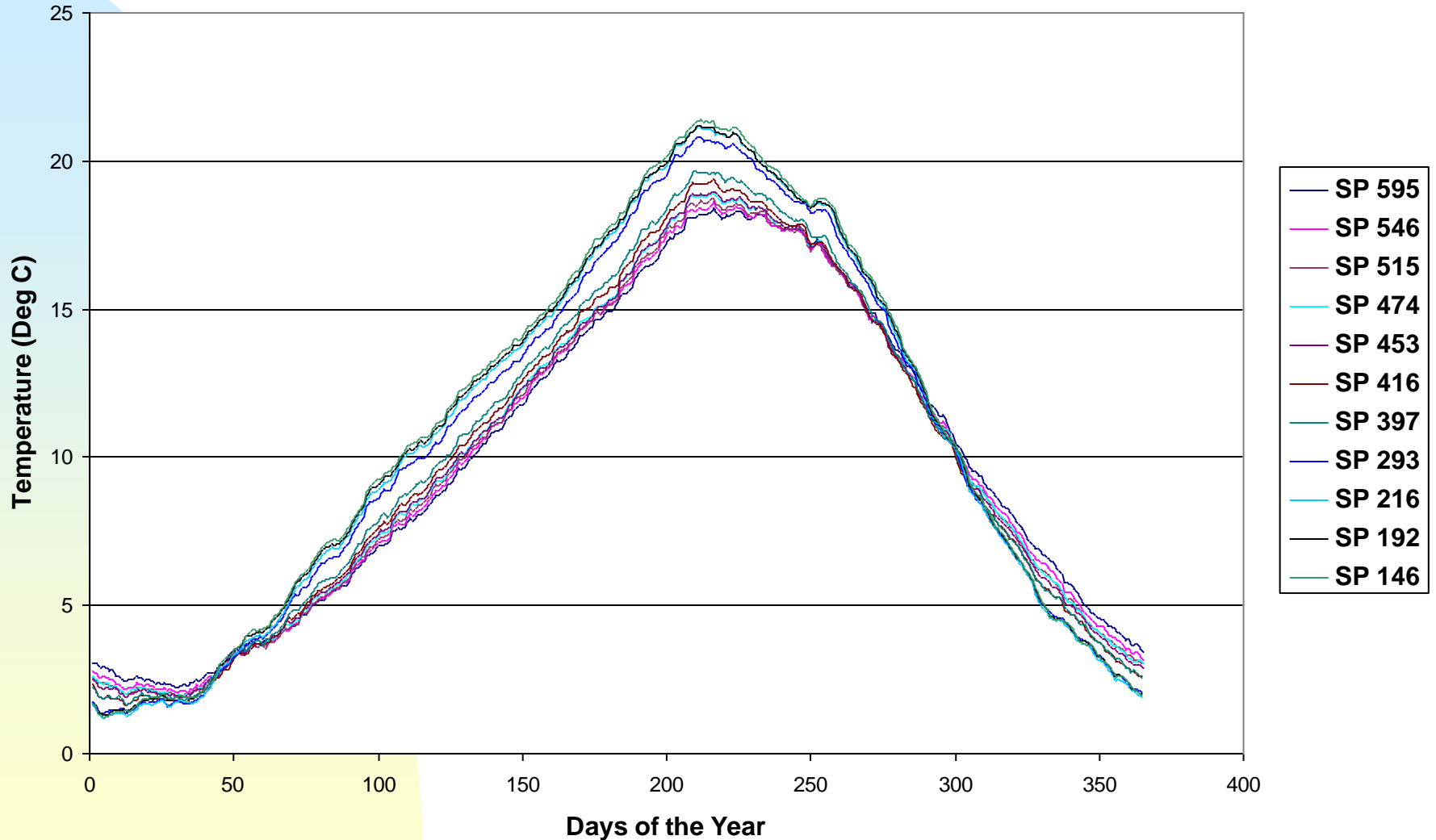
To account for this variability we utilize the mean daily site potential temperatures based on 30 years of simulations using actual weather and flow data.



Site Potential Temperatures

- We have simulated Site Potential Temperatures for River Reaches.
- The reaches are defined by the dams. There are 15 reaches. The target site for each reach is in the tailrace of the dam at the foot of the reach.
- We have calculated the mean site potential (30 year mean) for each day of the year at each target site.

Columbia River Site Potential Temperatures at Each Target Site



Target Temperatures

- Apply Target Temperatures to the Average SP Reach by Reach.
- SP in the formulas = the 30 year average site potential for each day of the year.

TMDL Implications

- Essentially this TMDL is based on site potential in the main-stems.
- Water flowing into the TMDL from tributaries and boundary conditions is probably not at site potential.
- If the Site Potential Temperature of the tributaries or the boundary conditions are significantly different from existing conditions they could cause the TMDL to be too lenient or too restrictive.

TMDL Implications

We will address this in the TMDL with a sensitivity analysis.

How much would changes in temperature in the tributaries and at the boundary conditions alter the improvement in temperature needed downstream?

Eventually, the site potential temperatures of the tributaries will be estimated as tributary TMDLs are completed.

Columbia Tributaries

	ΔT to change Columbia T by 0.5 °C	ΔT to change Columbia T by 0.14 °C
Spokane R.	7.0	1.9
Okanagan	17	4.9
Yakima R.	17	4.8

Columbia Tributaries

	ΔT to change Columbia T by 0.5 °C	ΔT to change Columbia T by 0.14 °C
Deschutes	16	4.6
Willamette	3.2	0.92

TMDL Implications

It would be very helpful to estimate site potential at the boundary conditions.

What effect does human activity have on temperature upstream of the TMDL study area?

Available Information

What information on the effect of human activity on temperature is available?